STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SW Proposed

Pipe Sizes Proposed Manhole Sizes Proposed

FEH Rainfall Model	
Return Period (years)	2
Site Location	GB 450500 225250 SP 50500 25250
C (1km)	-0.023
D1 (1km)	0.328
D2 (1km)	0.309
D3 (1km)	0.264
E (1km)	0.292
F (1km)	2.461
Maximum Rainfall (mm/hr)	0
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.000
Maximum Backdrop Height (m)	0.000
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	0.75
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for SW Proposed

- Indicates pipe length does not match coordinates

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.000	35.951	0.629	57.2	0.031	5.00	0.0	0.600	o	225	
1.001	26.411	0.215	122.8	0.056	0.00	0.0	0.600	o	150	
1.002	10.321	0.104	99.2	0.100	0.00	0.0	0.600	o	300	
2.000	20.687	0.097	213.3	0.363	5.00	0.0	0.600	o	375	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	0.00	5.35	120.021	0.031	0.0	0.0	0.0	1.73	68.9	0.0
1.001	0.00	5.83	119.392	0.087	0.0	0.0	0.0	0.91	16.0	0.0
1.002	0.00	5.94	119.027	0.187	0.0	0.0	0.0	1.58	111.6	0.0
2.000	0.00	5.28	119.600	0.363	0.0	0.0	0.0	1.24	136.6	0.0

Network Design Table for SW Proposed

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
3.000	30.988	0.327	94.8	0.293	5.00	0.0	0.600	o	225	
2.001	43.746	0.406	107.7	0.132	0.00	0.0	0.600	o	375	
4.000	25.387	0.211	120.3	0.099	5.00	0.0	0.600	o	100	
2.002	31.824	0.107	297.4	0.000	0.00	0.0	0.600	o	375	
2.003	10.659	0.040	266.5	0.029	0.00	0.0	0.600	o	375	
5.000	3.241	0.135	24.0	0.030	5.00	0.0	0.600	o	150	
1.003	5.814	0.247	23.5	0.000	0.00	0.0	0.600	o	525	
6.000	10.291	0.100	102.9	0.067	5.00	0.0	0.600	o	150	
6.001	35.031	0.190	184.4	0.043	0.00	0.0	0.600	o	450	
7.000	8.639	0.150	57.6	0.058	5.00	0.0	0.600	o	150	
8.000	8.459	0.180	47.0	0.012	5.00	0.0	0.600	o	100	
6.002	20.609	0.050	412.2	0.046	0.00	0.0	0.600	o	450	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.000	0.00	5.38	119.980	0.293	0.0	0.0	0.0	1.34	53.4	0.0
2.001	0.00	5.80	119.503	0.788	0.0	0.0	0.0	1.75	192.7	0.0
4.000	0.00	5.60	119.583	0.099	0.0	0.0	0.0	0.70	5.5	0.0
2.002	0.00	6.31	119.097	0.887	0.0	0.0	0.0	1.05	115.5	0.0
2.003	0.00	6.47	118.990	0.916	0.0	0.0	0.0	1.11	122.1	0.0
5.000	0.00	5.03	119.257	0.030	0.0	0.0	0.0	2.06	36.5	0.0
1.003	0.00	6.49	118.917	1.133	0.0	0.0	0.0	4.63	1002.5	0.0
6.000	0.00	5.17	119.850	0.067	0.0	0.0	0.0	0.99	17.5	0.0
6.001	0.00	5.56	119.450	0.110	0.0	0.0	0.0	1.49	237.6	0.0
7.000	0.00	5.11	119.710	0.058	0.0	0.0	0.0	1.33	23.5	0.0
8.000	0.00	5.13	119.790	0.012	0.0	0.0	0.0	1.13	8.9	0.0
6.002	0.00	5.91	119.260	0.226	0.0	0.0	0.0	1.00	158.3	0.0

Network Design Table for SW Proposed

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
9.000	9.321	0.120	77.7	0.020	5.00	0.0	0.600	o	100	
10.000	8.500	0.065	130.8	0.027	5.00	0.0	0.600	o	150	
10.001	17.464	0.085	205.5	0.025	0.00	0.0	0.600	o	225	
6.003	9.923	0.030	330.8	0.008	0.00	0.0	0.600	o	450	
6.004	44.707	0.110	406.4	0.072	0.00	0.0	0.600	o	450	
11.000	20.794	0.410	50.7	0.043	5.00	0.0	0.600	o	100	
12.000	13.000	0.410	31.7	0.034	5.00	0.0	0.600	o	100	
6.005	14.925	0.040	373.1	0.017	0.00	0.0	0.600	o	450	
6.006	20.938	0.060	349.0	0.069	0.00	0.0	0.600	o	450	
13.000	54.575	0.285	191.5	0.048	5.00	0.0	0.600	o	300	
14.000	9.910	0.505	19.6	0.020	5.00	0.0	0.600	o	100	
13.001	38.354	0.200	191.8	0.145	0.00	0.0	0.600	o	375	
13.002	15.342	0.080	191.8	0.028	0.00	0.0	0.600	o	375	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
9.000	0.00	5.18	119.680	0.020	0.0	0.0	0.0	0.87	6.9	0.0
10.000	0.00	5.16	119.660	0.027	0.0	0.0	0.0	0.88	15.5	0.0
10.001	0.00	5.48	119.520	0.052	0.0	0.0	0.0	0.91	36.1	0.0
6.003	0.00	6.06	119.210	0.306	0.0	0.0	0.0	1.11	176.9	0.0
6.004	0.00	6.80	119.180	0.378	0.0	0.0	0.0	1.00	159.4	0.0
11.000	0.00	5.32	119.830	0.043	0.0	0.0	0.0	1.08	8.5	0.0
12.000	0.00	5.16	119.830	0.034	0.0	0.0	0.0	1.38	10.8	0.0
6.005	0.00	7.04	119.070	0.472	0.0	0.0	0.0	1.05	166.4	0.0
6.006	0.00	7.36	119.030	0.541	0.0	0.0	0.0	1.08	172.2	0.0
13.000	0.00	5.80	120.080	0.048	0.0	0.0	0.0	1.13	80.1	0.0
14.000	0.00	5.09	120.500	0.020	0.0	0.0	0.0	1.75	13.8	0.0
13.001	0.00	6.29	119.720	0.213	0.0	0.0	0.0	1.30	144.1	0.0
13.002	0.00	6.49	119.520	0.241	0.0	0.0	0.0	1.30	144.1	0.0

Network Design Table for SW Proposed

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
15.000	4.116	0.355	11.6	0.057	5.00	0.0	0.600	o	100	
13.003	26.268	0.090	291.9	0.022	0.00	0.0	0.600	o	450	
13.004	21.846	0.070	312.1	0.086	0.00	0.0	0.600	o	450	
16.000	12.378	2.095	5.9	0.306	5.00	0.0	0.600	o	150	
13.005	63.703	0.205	310.7	0.071	0.00	0.0	0.600	o	450	
13.006	10.487	0.030	349.6	0.052	0.00	0.0	0.600	o	450	
6.007	22.963	0.055	417.5	0.037	0.00	0.0	0.600	o	450	
6.008	16.803	0.015	1120.2	0.000	0.00	0.0	0.600	o	600	
6.009	89.530	0.200	447.7	0.000	0.00	0.0	0.600	o	450	
6.010	10.304	0.030	343.5	0.000	0.00	0.0	0.600	o	450	
1.004	6.330	0.020	316.5	0.000	0.00	0.0	0.600	o	525	
1.005	17.012	0.030	567.1	0.000	0.00	0.0	0.600	o	525	
1.006	4.644	0.023	201.9	0.000	0.00	0.0	0.600	o	525	
17.000	8.461	0.042	201.5	0.059	5.00	0.0	0.600	o	225	
17.001	38.682	0.240	161.2	0.000	0.00	0.0	0.600	o	225	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
15.000	0.00	5.03	120.070	0.057	0.0	0.0	0.0	2.28	17.9	0.0
13.003	0.00	6.86	119.365	0.320	0.0	0.0	0.0	1.18	188.4	0.0
13.004	0.00	7.18	119.275	0.406	0.0	0.0	0.0	1.15	182.2	0.0
16.000	0.00	5.05	121.600	0.306	0.0	0.0	0.0	4.17	73.8	0.0
13.005	0.00	8.10	119.205	0.783	0.0	0.0	0.0	1.15	182.6	0.0
13.006	0.00	8.26	119.000	0.835	0.0	0.0	0.0	1.08	172.0	0.0
6.007	0.00	8.65	118.970	1.413	0.0	0.0	0.0	0.99	157.2	0.0
6.008	0.00	9.04	118.915	1.413	0.0	0.0	0.0	0.72	203.3	0.0
6.009	0.00	10.60	118.900	1.413	0.0	0.0	0.0	0.95	151.8	0.0
6.010	0.00	10.76	118.700	1.413	0.0	0.0	0.0	1.09	173.6	0.0
1.004	0.00	10.84	118.670	2.546	0.0	0.0	0.0	1.25	271.4	0.0
1.005	0.00	11.15	118.500	2.546	0.0	0.0	0.0	0.93	202.1	0.0
1.006	0.00	11.20	118.470	2.546	0.0	0.0	0.0	1.57	340.4	0.0
17.000	0.00	5.15	118.929	0.059	0.0	0.0	0.0	0.92	36.5	0.0
17.001	0.00	5.78	118.887	0.059	0.0	0.0	0.0	1.03	40.8	0.0

Network Design Table for SW Proposed

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
17.002	7.950	0.001	7950.0	0.046	0.00	0.0	0.600	o	300	
17.003	7.429	0.001	7429.0	0.000	0.00	0.0	0.600	o	300	
18.000	56.396	0.150	376.0	0.156	5.00	0.0	0.600	o	525	
18.001	8.750	0.030	291.7	0.000	0.00	0.0	0.600	o	525	
18.002	23.509	0.060	391.8	0.000	0.00	0.0	0.600	o	525	
1.007	39.974	0.097	412.1	0.000	0.00	0.0	0.600	o	825	
19.000	43.785	0.350	125.1	0.050	5.00	0.0	0.600	o	225	
19.001	39.860	0.310	128.6	0.035	0.00	0.0	0.600	o	225	
19.002	17.212	0.150	114.7	0.020	0.00	0.0	0.600	o	225	
19.003	16.576	0.185	89.6	0.050	0.00	0.0	0.600	o	225	
20.000	15.588	0.100	155.9	0.020	5.00	0.0	0.600	o	225	
19.004	27.299	0.140	195.0	0.030	0.00	0.0	0.600	o	300	
21.000	2.070	0.025	82.8	0.010	5.00	0.0	0.600	o	225	
19.005	10.000#	0.050	200.0	0.015	0.00	0.0	0.600	o	300	
19.006	22.053	0.090	245.0	0.000	0.00	0.0	0.600	o	375	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
17.002	0.00	6.57	118.572	0.105	0.0	0.0	0.0	0.17	11.8	0.0
17.003	0.00	7.29	118.571	0.105	0.0	0.0	0.0	0.17	12.2	0.0
18.000	0.00	5.82	118.570	0.156	0.0	0.0	0.0	1.15	248.8	0.0
18.001	0.00	5.93	118.420	0.156	0.0	0.0	0.0	1.31	282.8	0.0
18.002	0.00	6.28	118.390	0.156	0.0	0.0	0.0	1.13	243.6	0.0
1.007	0.00	11.65	118.297	2.807	0.0	0.0	0.0	1.46	778.4	0.0
19.000	0.00	5.62	119.610	0.050	0.0	0.0	0.0	1.17	46.4	0.0
19.001	0.00	6.20	119.260	0.085	0.0	0.0	0.0	1.15	45.8	0.0
19.002	0.00	6.44	118.950	0.105	0.0	0.0	0.0	1.22	48.5	0.0
19.003	0.00	6.64	118.800	0.155	0.0	0.0	0.0	1.38	54.9	0.0
20.000	0.00	5.25	118.715	0.020	0.0	0.0	0.0	1.04	41.5	0.0
19.004	0.00	7.04	118.540	0.205	0.0	0.0	0.0	1.12	79.3	0.0
21.000	0.00	5.02	118.500	0.010	0.0	0.0	0.0	1.44	57.2	0.0
19.005	0.00	7.19	118.400	0.230	0.0	0.0	0.0	1.11	78.3	0.0
19.006	0.00	7.51	118.350	0.230	0.0	0.0	0.0	1.15	127.3	0.0

Network Design Table for SW Proposed

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
19.007	4.311	0.050	86.2	0.035	0.00	0.0	0.600	o	100	
19.008	17.441	0.070	249.2	0.000	0.00	0.0	0.600	o	100	
1.008	17.691	0.020	884.5	0.000	0.00	0.0	0.600	\/	40	
22.000	9.076	0.010	907.6	0.000	5.00	0.0	0.600	o	100	
23.000	8.298	0.065	127.7	0.000	5.00	0.0	0.600	o	150	
1.009	29.315	0.030	977.2	0.000	0.00	0.0	0.600	\/	40	
24.000	13.020	0.150	86.8	0.031	5.00	0.0	0.600	o	150	
24.001	46.306	0.445	104.1	0.064	0.00	0.0	0.600	o	225	
24.002	33.231	0.150	221.5	0.006	0.00	0.0	0.600	o	300	
24.003	30.902	0.105	294.3	0.046	0.00	0.0	0.600	o	300	
25.000	17.082	0.385	44.4	0.014	5.00	0.0	0.600	o	150	
26.000	19.030	0.896	21.2	0.024	5.00	0.0	0.600	o	150	
27.000	19.276	0.428	45.0	0.025	5.00	0.0	0.600	o	150	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
19.007	0.00	7.60	118.260	0.265	0.0	0.0	0.0	0.83	6.5	0.0
19.008	0.00	8.20	118.210	0.265	0.0	0.0	0.0	0.48	3.8	0.0
1.008	0.00	11.80	117.700	3.072	0.0	0.0	0.0	1.98	7777.0	0.0
22.000	0.00	5.61	118.104	0.000	0.0	0.0	0.0	0.25	1.9	0.0
23.000	0.00	5.16	118.017	0.000	0.0	0.0	0.0	0.89	15.7	0.0
1.009	0.00	12.06	117.680	3.072	0.0	0.0	0.0	1.88	7396.8	0.0
24.000	0.00	5.20	118.900	0.031	0.0	0.0	0.0	1.08	19.1	0.0
24.001	0.00	5.80	118.675	0.095	0.0	0.0	0.0	1.28	51.0	0.0
24.002	0.00	6.33	118.155	0.101	0.0	0.0	0.0	1.05	74.4	0.0
24.003	0.00	6.89	118.005	0.147	0.0	0.0	0.0	0.91	64.4	0.0
25.000	0.00	5.19	118.850	0.014	0.0	0.0	0.0	1.51	26.8	0.0
26.000	0.00	5.14	119.346	0.024	0.0	0.0	0.0	2.20	38.8	0.0
27.000	0.00	5.21	118.878	0.025	0.0	0.0	0.0	1.50	26.6	0.0

Network Design Table for SW Proposed

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
28.000	14.362	0.105	136.8	0.006	5.00	0.0	0.600	o	150	
25.001	21.385	0.215	99.5	0.072	0.00	0.0	0.600	o	100	
24.004	6.167	0.030	205.6	0.006	0.00	0.0	0.600	o	300	
24.005	11.830	0.050	236.6	0.022	0.00	0.0	0.600	o	300	
24.006	18.250	0.070	260.7	0.046	0.00	0.0	0.600	o	300	
29.000	14.070	0.060	234.5	0.050	5.00	0.0	0.600	oo	42	
29.001	13.870	0.060	231.2	0.050	0.00	0.0	0.600	oo	42	
24.007	13.971	0.050	279.4	0.006	0.00	0.0	0.600	oo	42	
24.008	2.837	0.020	141.9	0.000	0.00	0.0	0.600	o	375	
24.009	3.473	0.020	173.7	0.000	0.00	0.0	0.600	o	375	
1.010	4.365	0.005	873.0	0.000	0.00	0.0	0.600	\/	40	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
28.000	0.00	5.28	118.420	0.006	0.0	0.0	0.0	0.86	15.2	0.0
25.001	0.00	5.74	118.315	0.141	0.0	0.0	0.0	0.77	6.1	0.0
24.004	0.00	6.99	117.900	0.294	0.0	0.0	0.0	1.09	77.2	0.0
24.005	0.00	7.18	117.870	0.316	0.0	0.0	0.0	1.02	71.9	0.0
24.006	0.00	7.50	117.820	0.362	0.0	0.0	0.0	0.97	68.5	0.0
29.000	0.00	5.20	117.870	0.050	0.0	0.0	0.0	1.18	260.6	0.0
29.001	0.00	5.39	117.810	0.100	0.0	0.0	0.0	1.19	262.5	0.0
24.007	0.00	7.71	117.750	0.468	0.0	0.0	0.0	1.08	238.5	0.0
24.008	0.00	7.74	117.700	0.468	0.0	0.0	0.0	1.52	167.8	0.0
24.009	0.00	7.79	117.680	0.468	0.0	0.0	0.0	1.37	151.5	0.0
1.010	0.00	12.10	117.650	3.540	0.0	0.0	0.0	1.99	7828.5	0.0

Free Flowing Outfall Details for SW Proposed

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.010		0.000	117.645	0.000	0	0

Simulation Criteria for SW Proposed

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	1.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	19
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location GB 450500 225250 SP 50500 25250	
C (1km)	-0.023
D1 (1km)	0.328
D2 (1km)	0.309
D3 (1km)	0.264
E (1km)	0.292
F (1km)	2.461
Summer Storms	No
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	15

Online Controls for SW Proposed

Hydro-Brake® Manhole: 15 (D5a), DS/PN: 6.009, Volume (m³): 8.6

Design Head (m) 1.600 Hydro-Brake® Type Md6 SW Only Invert Level (m) 118.900
Design Flow (l/s) 92.0 Diameter (mm) 337

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	10.8	1.200	93.2	3.000	112.6	7.000	171.4
0.200	31.7	1.400	91.5	3.500	121.3	7.500	177.4
0.300	55.2	1.600	91.6	4.000	129.6	8.000	183.3
0.400	76.1	1.800	93.1	4.500	137.5	8.500	188.9
0.500	90.9	2.000	95.6	5.000	144.9	9.000	194.4
0.600	97.3	2.200	98.6	5.500	152.0	9.500	199.7
0.800	99.3	2.400	102.0	6.000	158.7		
1.000	96.6	2.600	105.5	6.500	165.2		

Pre-initialised control selected, excessive flows may result.

Orifice Manhole: 36 (TC), DS/PN: 24.008, Volume (m³): 5.7

Diameter (m) 0.320 Discharge Coefficient 0.600 Invert Level (m) 117.700

Storage Structures for SW Proposed

Porous Car Park Manhole: PP (D5a), DS/PN: 6.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.3
Membrane Percolation (mm/hr)	1000	Length (m)	25.0
Max Percolation (l/s)	71.5	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	120.000	Cap Volume Depth (m)	0.000

Porous Car Park Manhole: PP (D5a), DS/PN: 7.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	18.0
Max Percolation (l/s)	50.0	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	119.850	Cap Volume Depth (m)	0.000

Porous Car Park Manhole: PP (D5a), DS/PN: 8.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	13.5
Max Percolation (l/s)	18.8	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	120.150	Cap Volume Depth (m)	0.000

Porous Car Park Manhole: PP (D5a), DS/PN: 9.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.0
Membrane Percolation (mm/hr)	1000	Length (m)	18.0
Max Percolation (l/s)	30.0	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	120.000	Cap Volume Depth (m)	0.000

Porous Car Park Manhole: PP (D5a), DS/PN: 10.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	18.0
Max Percolation (l/s)	25.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	120.000	Cap Volume Depth (m)	0.000

Porous Car Park Manhole: PP (D5a), DS/PN: 11.000

Infiltration Coefficient Base (m/hr)	0.00000	Max Percolation (l/s)	68.4
Membrane Percolation (mm/hr)	1000	Safety Factor	2.0

Porous Car Park Manhole: PP (D5a), DS/PN: 11.000

Porosity	0.30	Slope (1:X)	300.0
Invert Level (m)	120.150	Depression Storage (mm)	5
Width (m)	8.8	Evaporation (mm/day)	3
Length (m)	28.0	Cap Volume Depth (m)	0.000

Porous Car Park Manhole: PP (D5a), DS/PN: 12.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.7
Membrane Percolation (mm/hr)	1000	Length (m)	27.0
Max Percolation (l/s)	80.3	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	120.220	Cap Volume Depth (m)	0.000

Porous Car Park Manhole: PP (D5a), DS/PN: 14.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	18.0
Max Percolation (l/s)	25.0	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	120.700	Cap Volume Depth (m)	0.000

Porous Car Park Manhole: PP (D5a), DS/PN: 15.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	13.1
Membrane Percolation (mm/hr)	1000	Length (m)	32.0
Max Percolation (l/s)	116.4	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	120.600	Cap Volume Depth (m)	0.000

Tank or Pond Manhole: Pond (D5a), DS/PN: 6.008

Invert Level (m) 118.915

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	204.4	1.885	639.3

Tank or Pond Manhole: 23 (TC), DS/PN: 20.000

Invert Level (m) 118.715

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	26.0	0.400	26.0	0.410	0.0

Tank or Pond Manhole: 24 (TC), DS/PN: 19.004

Invert Level (m) 118.540

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	26.0	0.400	26.0	0.401	0.0

Filter Drain Manhole: FD (TC), DS/PN: 21.000

Infiltration Coefficient Base (m/hr)	0.00300	Trench Length (m)	25.0
Infiltration Coefficient Side (m/hr)	0.00300	Pipe Diameter (m)	0.150
Safety Factor	1.0	Pipe Depth above Invert (m)	0.000
Porosity	0.30	Slope (1:X)	300.0
Invert Level (m)	118.790	Cap Volume Depth (m)	0.000
Trench Width (m)	2.7	Cap Infiltration Depth (m)	0.000

Filter Drain Manhole: 26 (TC), DS/PN: 19.006

Infiltration Coefficient Base (m/hr)	0.00300	Trench Length (m)	29.0
Infiltration Coefficient Side (m/hr)	0.00300	Pipe Diameter (m)	0.300
Safety Factor	1.0	Pipe Depth above Invert (m)	0.000
Porosity	0.30	Slope (1:X)	900.0
Invert Level (m)	118.500	Cap Volume Depth (m)	0.000
Trench Width (m)	2.7	Cap Infiltration Depth (m)	0.000

Tank or Pond Manhole: Tank (TC), DS/PN: 19.007

Invert Level (m) 118.280

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	136.0	0.400	136.0	0.401	0.0

Filter Drain Manhole: 29 (TC), DS/PN: 25.001

Infiltration Coefficient Base (m/hr)	0.00300	Trench Length (m)	92.0
Infiltration Coefficient Side (m/hr)	0.00300	Pipe Diameter (m)	0.150
Safety Factor	1.0	Pipe Depth above Invert (m)	0.000
Porosity	0.30	Slope (1:X)	500.0
Invert Level (m)	118.200	Cap Volume Depth (m)	0.000
Trench Width (m)	2.4	Cap Infiltration Depth (m)	0.000

Tank or Pond Manhole: 31 (TC), DS/PN: 24.005

Invert Level (m) 117.870

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	76.0	0.500	76.0	0.501	0.0

Tank or Pond Manhole: 33 (TC), DS/PN: 29.000

Invert Level (m) 117.890

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	55.0	0.400	55.0	0.401	0.0

Tank or Pond Manhole: 34 (TC), DS/PN: 29.001

Invert Level (m) 117.810

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	45.0	0.400	45.0	0.401	0.0

Summary of Critical Results by Maximum Level (Rank 1) for SW Proposed

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	1.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	19
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
Site Location GB 450500 225250 SP 50500 25250	
C (1km)	-0.023
D1 (1km)	0.328
D2 (1km)	0.309
D3 (1km)	0.264
E (1km)	0.292
F (1km)	2.461
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	100
Climate Change (%)	30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	100	+30%					
1.001	15 Winter	100	+30%	100/15 Summer	100/15 Summer			5
1.002	15 Summer	100	+30%	100/15 Summer				
2.000	15 Winter	100	+30%	100/15 Summer	100/15 Summer			6
3.000	15 Winter	100	+30%	100/15 Summer	100/15 Summer			7
2.001	15 Winter	100	+30%	100/15 Summer	100/15 Summer			3
4.000	30 Winter	100	+30%	100/15 Summer	100/15 Summer			10
2.002	15 Summer	100	+30%	100/15 Summer				
2.003	15 Summer	100	+30%	100/15 Summer				
5.000	15 Winter	100	+30%	100/15 Summer				
1.003	60 Winter	100	+30%	100/15 Summer				
6.000	15 Winter	100	+30%	100/15 Summer				
6.001	15 Winter	100	+30%	100/15 Summer				
7.000	60 Winter	100	+30%	100/15 Summer				
8.000	15 Winter	100	+30%	100/15 Summer				

Summary of Critical Results by Maximum Level (Rank 1) for SW Proposed

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
6.002	15 Winter	100	+30%	100/15 Summer				
9.000	60 Winter	100	+30%	100/15 Summer				
10.000	15 Winter	100	+30%	100/15 Summer				
10.001	15 Winter	100	+30%	100/15 Summer				
6.003	15 Winter	100	+30%	100/15 Summer				
6.004	15 Winter	100	+30%	100/15 Summer				
11.000	15 Winter	100	+30%	100/15 Summer				
12.000	15 Winter	100	+30%	100/15 Summer				
6.005	15 Winter	100	+30%	100/15 Summer				
6.006	15 Winter	100	+30%	100/15 Summer				
13.000	15 Winter	100	+30%	100/15 Summer	100/15 Summer			2
14.000	15 Winter	100	+30%	100/15 Summer				
13.001	15 Winter	100	+30%	100/15 Summer				
13.002	15 Winter	100	+30%	100/15 Summer				
15.000	15 Winter	100	+30%	100/15 Summer				
13.003	15 Winter	100	+30%	100/15 Summer				
13.004	15 Winter	100	+30%	100/15 Summer				
16.000	15 Winter	100	+30%	100/15 Summer	100/15 Summer			7
13.005	15 Winter	100	+30%	100/15 Summer				
13.006	15 Winter	100	+30%	100/15 Summer				
6.007	60 Winter	100	+30%	100/15 Summer				
6.008	60 Winter	100	+30%	100/15 Summer				
6.009	60 Winter	100	+30%	100/15 Summer	100/15 Winter			7
6.010	60 Winter	100	+30%	100/15 Summer				
1.004	60 Winter	100	+30%	100/15 Summer				
1.005	60 Winter	100	+30%	100/15 Summer				
1.006	60 Winter	100	+30%	100/15 Summer				
17.000	15 Winter	100	+30%	100/15 Summer				
17.001	15 Winter	100	+30%	100/15 Summer				
17.002	15 Winter	100	+30%	100/15 Summer				
17.003	15 Winter	100	+30%	100/15 Summer				
18.000	15 Winter	100	+30%					
18.001	15 Winter	100	+30%					
18.002	15 Winter	100	+30%					
1.007	15 Winter	100	+30%					
19.000	15 Winter	100	+30%	100/15 Summer				
19.001	15 Winter	100	+30%	100/15 Summer				
19.002	15 Winter	100	+30%	100/15 Summer				
19.003	15 Winter	100	+30%	100/15 Summer				
20.000	60 Winter	100	+30%	100/15 Summer				
19.004	60 Winter	100	+30%	100/15 Summer				
21.000	60 Winter	100	+30%	100/15 Summer				
19.005	60 Winter	100	+30%	100/15 Summer				
19.006	60 Winter	100	+30%	100/15 Summer				
19.007	60 Winter	100	+30%	100/15 Summer	100/30 Winter			
19.008	60 Winter	100	+30%	100/15 Summer				
1.008	30 Winter	100	+30%					
22.000	30 Winter	100	+30%					
23.000	30 Winter	100	+30%					
1.009	30 Winter	100	+30%					
24.000	15 Winter	100	+30%	100/15 Summer				

Summary of Critical Results by Maximum Level (Rank 1) for SW Proposed

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
24.001	15 Winter	100	+30%	100/15 Summer				
24.002	15 Winter	100	+30%	100/15 Summer				
24.003	15 Winter	100	+30%	100/15 Summer				
25.000	15 Winter	100	+30%					
26.000	15 Winter	100	+30%					
27.000	15 Winter	100	+30%					
28.000	30 Winter	100	+30%	100/15 Summer				
25.001	30 Winter	100	+30%	100/15 Summer	100/15 Winter			3
24.004	30 Winter	100	+30%	100/15 Summer				
24.005	30 Winter	100	+30%	100/15 Summer				
24.006	30 Winter	100	+30%	100/15 Summer				
29.000	30 Winter	100	+30%	100/15 Winter				
29.001	30 Winter	100	+30%	100/15 Summer				
24.007	30 Winter	100	+30%	100/15 Summer				
24.008	30 Winter	100	+30%	100/15 Summer				
24.009	30 Winter	100	+30%	100/15 Summer				
1.010	30 Winter	100	+30%					

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	0759	120.170	-0.076	0.000	0.36	0.0	23.4	OK
1.001	0761	120.089	0.547	11.716	1.80	0.0	27.5	FLOOD
1.002	0764	119.716	0.389	0.000	1.25	0.0	100.8	FLOOD RISK
2.000	Ex MH	120.755	0.780	54.582	0.87	0.0	99.9	FLOOD
3.000	1257	120.834	0.629	64.325	1.60	0.0	79.7	FLOOD
2.001	0760	120.677	0.799	3.929	1.18	0.0	207.7	FLOOD
4.000	0763	120.420	0.737	26.868	2.12	0.0	11.3	FLOOD
2.002	0762	120.234	0.762	0.000	1.97	0.0	202.0	FLOOD RISK
2.003	Ex MH	119.859	0.494	0.000	2.44	0.0	222.7	SURCHARGED
5.000	0767	119.688	0.281	0.000	1.02	0.0	23.5	FLOOD RISK
1.003	0766	119.559	0.117	0.000	0.71	0.0	270.2	SURCHARGED
6.000	PP (D5a)	120.270	0.270	0.000	1.23	0.0	19.3	SURCHARGED
6.001	1 (D5a)	120.302	0.402	0.000	0.17	0.0	36.1	SURCHARGED
7.000	PP (D5a)	120.229	0.369	0.000	0.73	0.0	15.1	FLOOD RISK
8.000	PP (D5a)	120.269	0.379	0.000	0.82	0.0	6.7	SURCHARGED
6.002	2 (D5a)	120.294	0.584	0.000	0.43	0.0	55.6	SURCHARGED
9.000	PP (D5a)	120.218	0.438	0.000	0.74	0.0	4.7	SURCHARGED
10.000	PP (D5a)	120.269	0.459	0.000	1.09	0.0	14.8	FLOOD RISK
10.001	3 (D5a)	120.281	0.536	0.000	0.71	0.0	22.9	SURCHARGED
6.003	4 (D5a)	120.286	0.626	0.000	0.62	0.0	72.4	SURCHARGED
6.004	5 (D5a)	120.281	0.651	0.000	0.74	0.0	106.8	SURCHARGED
11.000	PP (D5a)	120.315	0.385	0.000	1.21	0.0	9.9	SURCHARGED
12.000	PP (D5a)	120.324	0.394	0.000	1.17	0.0	11.9	SURCHARGED
6.005	6 (D5a)	120.238	0.718	0.000	1.11	0.0	126.6	SURCHARGED
6.006	7 (D5a)	120.197	0.717	0.000	1.21	0.0	170.1	SURCHARGED
13.000	8 (D5a)	121.383	1.003	2.997	0.56	0.0	42.7	FLOOD
14.000	PP (D5a)	120.976	0.376	0.000	1.06	0.0	13.5	SURCHARGED
13.001	9 (D5a)	121.394	1.299	0.000	0.87	0.0	113.5	SURCHARGED
13.002	10 (D5a)	121.290	1.395	0.000	1.16	0.0	128.2	SURCHARGED

Summary of Critical Results by Maximum Level (Rank 1) for SW Proposed

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
15.000	PP (D5a)	120.775	0.605	0.000	1.30	0.0	19.9	SURCHARGED
13.003	11 (D5a)	121.201	1.386	0.000	0.77	0.0	123.0	SURCHARGED
13.004	11a (D5a)	121.109	1.384	0.000	1.20	0.0	178.7	SURCHARGED
16.000	Para PI (D5a)	122.403	0.653	52.706	1.09	0.0	73.3	FLOOD
13.005	12 (D5a)	121.004	1.349	0.000	1.62	0.0	273.2	FLOOD RISK
13.006	13 (D5a)	120.425	0.975	0.000	2.70	0.0	303.0	SURCHARGED
6.007	14 (D5a)	120.183	0.763	0.000	2.46	0.0	320.7	SURCHARGED
6.008	Pond (D5a)	120.139	0.624	0.000	1.07	0.0	115.1	SURCHARGED
6.009	15 (D5a)	120.502	1.152	1.705	0.68	0.0	98.3	FLOOD
6.010	16 (D5a)	119.401	0.251	0.000	0.99	0.0	112.9	SURCHARGED
1.004	17 (D5a)	119.391	0.196	0.000	2.01	0.0	303.8	SURCHARGED
1.005	PI (D5a)	119.240	0.215	0.000	2.49	0.0	294.1	SURCHARGED
1.006	18 (D5a)	119.093	0.098	0.000	1.68	0.0	294.2	SURCHARGED
17.000	0745	119.455	0.301	0.000	1.49	0.0	44.0	SURCHARGED
17.001	0746	119.353	0.241	0.000	1.11	0.0	43.1	SURCHARGED
17.002	1208	119.049	0.177	0.000	2.12	0.0	75.9	SURCHARGED
17.003	Ex MH	118.951	0.080	0.000	2.01	0.0	76.1	SURCHARGED
18.000	0768	118.909	-0.186	0.000	0.51	0.0	115.3	OK
18.001	0765	118.858	-0.087	0.000	0.49	0.0	87.6	OK
18.002	Ex MH	118.838	-0.077	0.000	0.44	0.0	85.3	OK
1.007	0769	118.786	-0.336	0.000	0.66	0.0	408.3	OK
19.000	19 (TC)	120.547	0.712	0.000	0.71	0.0	31.3	FLOOD RISK
19.001	20 (TC)	120.372	0.887	0.000	1.15	0.0	50.1	FLOOD RISK
19.002	21 (TC)	119.956	0.781	0.000	1.41	0.0	61.2	FLOOD RISK
19.003	22 (TC)	119.671	0.646	0.000	1.83	0.0	89.5	FLOOD RISK
20.000	23 (TC)	119.101	0.161	0.000	0.13	0.0	4.7	SURCHARGED
19.004	24 (TC)	119.110	0.270	0.000	0.80	0.0	57.0	FLOOD RISK
21.000	FD (TC)	119.089	0.364	0.000	0.11	0.0	3.3	SURCHARGED
19.005	25 (TC)	119.099	0.399	0.000	1.00	0.0	61.2	SURCHARGED
19.006	26 (TC)	119.096	0.371	0.000	0.49	0.0	52.8	SURCHARGED
19.007	Tank (TC)	119.217	0.857	0.000	1.89	0.0	10.5	FLOOD RISK
19.008	1285 (TC)	118.778	0.468	0.000	2.72	0.0	9.9	SURCHARGED
1.008	Ditch	118.160	-0.811	0.000	0.20	0.0	402.3	OK
22.000	Abandon (TC)	118.129	-0.075	0.000	0.00	0.0	0.0	OK
23.000	Abandon (TC)	118.129	-0.038	0.000	0.00	0.0	0.0	OK
1.009	Ditch	118.129	-0.822	0.000	0.14	0.0	396.9	OK
24.000	IC (TC)	119.845	0.795	0.000	1.30	0.0	22.7	FLOOD RISK
24.001	26 (TC)	119.598	0.698	0.000	1.38	0.0	67.1	SURCHARGED
24.002	27 (TC)	118.801	0.346	0.000	0.97	0.0	66.0	SURCHARGED
24.003	28 (TC)	118.671	0.366	0.000	1.53	0.0	90.0	FLOOD RISK
25.000	IC (TC)	118.919	-0.081	0.000	0.43	0.0	10.8	OK
26.000	1191 (TC)	119.422	-0.074	0.000	0.51	0.0	18.5	FLOOD RISK
27.000	1266 (TC)	118.978	-0.050	0.000	0.77	0.0	19.2	OK
28.000	IC (TC)	118.907	0.337	0.000	0.21	0.0	3.0	SURCHARGED
25.001	29 (TC)	118.904	0.489	4.137	1.64	0.0	9.6	FLOOD
24.004	30 (TC)	118.539	0.339	0.000	1.42	0.0	77.0	FLOOD RISK
24.005	31 (TC)	118.470	0.300	0.000	0.94	0.0	54.5	FLOOD RISK
24.006	32 (TC)	118.390	0.270	0.000	1.09	0.0	64.2	FLOOD RISK
29.000	33 (TC)	118.325	0.080	0.000	0.08	0.0	15.7	SURCHARGED
29.001	34 (TC)	118.322	0.137	0.000	0.11	0.0	22.7	SURCHARGED

Summary of Critical Results by Maximum Level (Rank 1) for SW Proposed

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
24.007	35 (TC)	118.308	0.183	0.000	0.34	0.0	64.4	FLOOD RISK
24.008	36 (TC)	118.239	0.164	0.000	0.78	0.0	65.2	SURCHARGED
24.009	37 (TC)	118.155	0.100	0.000	0.80	0.0	65.5	SURCHARGED
1.010	Ditch	118.076	-0.845	0.000	0.13	0.0	444.8	OK